

Gas Tungsten Arc Welding (GTAW) Flux For Increased Penetration

Status: Transitioned

PROBLEM / OBJECTIVE

The gas tungsten arc welding (GTAW) process is used extensively by the builders of Navy surface ships and submarines for full-penetration welds in pipes, fittings, and other components. The process also is used in other industries, including aerospace, for a wide range of welding products. The production of full penetration welds is essential for these applications. Previous research showed that certain organic compounds, when used as a flux on the surface of the component to be welded, can substantially increase penetration and therefore provide the ability to increase the productivity of the GTAW process. This project provided benefits to the Navy by developing and implementing fluxes that can improve the production efficiency of gas tungsten arc welding for shipyard and industrial applications.

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

The GTAW fluxes developed during this project significantly improve the productivity of gas tungsten arc welding operations. The primary benefits of using these fluxes derive from their ability to increase weld penetration by more than 300 percent. This increased weld penetration can significantly reduce welding times and simplify weld joint preparation, making it possible to use a square butt joint where a groove was previously required. Weld distortion is also reduced due to a more symmetrical weld cross section.

Implementation and Technology Transfer:

Gas tungsten arc welding (GTAW) fluxes, developed and commercialized by the NJC, are being used in production to reduce costs and improve quality of Navy ships and aircraft. GTAW fluxes are commercially available for stainless steels, carbon steels, copper-nickel, and nickel alloys. GTAW fluxes are being successfully used on many Navy systems.

- Bath Iron Works is using GTAW flux to improve the quality and reduce the costs of stainless steel pipe welds on Arleigh Burke Class destroyers.
- Newport News Shipbuilding is using GTAW flux for fabrication of piping for aircraft carriers.



- GTAW fluxes are used to increase productivity and reduce distortion on turbine engine components.

Expected Benefits:

GTAW fluxes are being used to reduce costs and improve quality of gas tungsten arc welds for components for the Navy and commercial industry. These fluxes reduce welding time by 50 percent and produce consistent weld penetration regardless of heat-to-heat variations in base metal composition. One engine manufacturer that used GTAW flux to weld critical parts saved \$30,000 per assembly and reported "The results with flux were phenomenal." The estimated return on investment (ROI) for this project is over 9:1 and cost savings over 5 years are estimated to exceed \$20 million

TIME LINE / MILESTONE

Start Date: September 1993

End Date: August 2000

FUNDING

ManTech Investment: \$2,141K

PARTICIPANTS

Edison Welding Institute (EWI)
Hobart Brothers Company
The Ohio State University
University of Tennessee
Northrop Grumman Newport News
Babcock & Wilcox